CHROMOSOME NUMBERS IN LEGUMINOSAE FROM THE STATE OF SÃO PAULO, BRAZIL

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Despite the large size of the family and its considerable economic and botanical importance, the Leguminosae continue to be poorly known cytologically. In 1974 Bandel indicated that less than 20% of the species had been studied cytologically, and it is doubtful that the current figure would attain 30%. Further, many of the taxa investigated are known from a single or few reports. Confirmation of these reports is clearly desirable, as are additional reports from different areas of geographical distribution. Although the Leguminosae are well represented in the Brazilian flora, the only significant investigations devoted exclusively to the cytology of Brazilian Legumes are those of Turner and Irwin (1961) who reported chromosome counts for 18 species in 10 genera and of Bandel (1974) who presented counts for 42 species in 25 genera and discussed the evolutionary significance of chromosome numbers in the family. The present paper has the objective of advancing the knowledge of the cytology of the Brazilian Leguminosae and reports chromosome counts for 53 species in 17 genera. Apparent first reports are presented for 19 species.

MATERIALS AND METHODS

All the material studied during this investigation was collected within the state of São Paulo. The chromosome counts are all meiotic and were obtained through the study of microsporogenesis. Buds were fixed in a solution of 4 parts chloroform: 3 parts ethyl alcohol: 1 part propionic acid. Staining was done with acetocarmine. The chromosome numbers reported are the responsibility of the senior author. Voucher material was identified by the authors with the valuable collaboration of Dr. Graziella Maciel Barroso and Haroldo Cavalcante de Lima. The voucher of *Arachis prostrata* Benth. was identified by Dr. Arturo Burkart. A complete set of voucher material has been deposited in the herbarium of the Jardim Botânica do Rio de Janeiro (RB) and a nearly complete set in the herbarium of the Instituto de Botânica de São Paulo (SP). Darlington and Wylie (1955) and the annual Index to Plant Chromosome Numbers (Moore, 1974) were used as primary reference sources.

When possible, original publications were also consulted. Table 1 lists the species studied and summarizes the results. In all cases voucher numbers are those of the authors.

Table 1. List of material examined for chromosome number

Species	*n*=	Município of origin and voucher number
CAESALPINIODEAE		
Cassieae		
Cassia bicapsularis L.	14	São José do Rio Preto. 48.
	14	Jaboticabal. 56.
Cassia flexuosa L.	8	São José do Rio Preto. 1.
Cassia javanica L.	14	Piracicaba. Cultivated. 46.
Cassia langsdorfii Kunth. var. *parvifolia* Irwin	7	Botucatu. 29.
Cassia latistipula Benth.	7	São José do Rio Preto. Cultivated. 15.
Cassia multijuga Rich.	12	São José do Rio Preto. Cultivated. 42, 51.
	12	Amparo. Cultivated? 64.
Cassia occidentalis L.	13	São José do Rio Preto. 35.
Cassia patellaria DC.	16	São José do Rio Preto. 36.
Cassia pilifera Vog.	11	São José do Rio Preto. 53.
Cassia rotundifolia Pers.	8	São José do Rio Preto. 10.
Cassia rugosa G. Don.	14	Corumbataí. 40.
	14	São José do Rio Preto. 54.
Cassia siamea Lam.	14	Jaboticabal. Cultivated. 58.
Cassia speciosa Schrad.	13	São José do Rio Preto. Cultivated. 37.
	13	Piracicaba. Cultivated. 45.
Cassia splendida Vog.	13	Botucatu. 33.
Cassia tetraphylla Desv. var. *mollissima* (Benth.) Irwin	7	Corumbataí. 39.
Cassia tetraphylla Desv. var. *tetraphylla*	7	Botucatu. 17.
Cassia tora L.	13	São José do Rio Preto. 5.
Cassia sp.	14	São José do Rio Preto. Cultivated. 13.
PAPILIONOIDEAE		
Aeschynomemeae		
Aeschynomene falcata (Poir.) D.C.	10	Botucatu. 18.
Aeschynomene racemosa Vog.	10	São José do Rio Preto. 55.
Crotalarieae		
Crotalaria anagyroides H. B. K.	8	São José do Rio Preto. 12.

Crotalaria depauperata Mart.	8	Botucatu. 34.
Crotalaria foliosa Benth.	16	São José do Rio Preto. 62.
Crotalaria incana L.	7	Botucatu. 32.
	7	São José do Rio Preto. 49.
Crotalaria laeta Mart.	8	São José do Rio Preto. 11.
Crotalaria maypurensis H. B.K.	8	Botucatu. 25.
Crotalaria spectabilis Roth.	8	Botucatu. 47.
Crotalaria stipularia Desv.	16	São José do Rio Preto. 7.
	16	São Pedro. 43.
Crotalaria velutina Benth.	16	Botucatu. 30.
Desmodieae		
Desmodium platycarpum Benth.	11	São José do Rio Preto. 70.
Diocleae		
Canavalia brasiliensis Mart. ex Benth.	11	São José do Rio Preto. Cultivated. 59.
Galactieae		
Galactia decumbens (Benth.) Chad. & Hassl.	10	Botucatu. 20.
Galactia eriosematoides Harms.	10	São José do Rio Preto. 74.
Geoffroeeae		
Pterodon pubescens Benth.	8	São José do Rio Preto. 60.
Glycineae		
Centrosema bracteosum Benth.	10	São José do Rio Preto. 61.
Centrosema brasilianum (L.) Benth.	10	São José do Rio Preto. 2.
Indigofereae		
Indigofera suffruticosa Mill.	8	São José do Rio Preto. 8.
Phaseoleae		
Phaseolus bracteatus Nees & Mart.	11	São José do Rio Preto. 4.
Phaseolus lathyroides L.	11	São José do Rio Preto. Cultivated. 44.
Pterocarpeae		
Machaerium aculeatum Raddi	10	Botucatu. 23.
Tipuana tipu (Benth.) O.K.	10	São José do Rio Preto. Cultivated. 65.
Robinieae		
Gliricidia sepium Steud.	11	São José do Rio Preto. Cultivated. 14.
Stylosantheae		
Arachis prostrata Benth.	20	São José do Rio Preto. 3.
Stylosanthes guianensis Sw.	10	São José do Rio Preto. 9.
Zornia diphylla (L.) Pers.	10	Botucatu. 22.
Zornia pardina Mohl.	10	Botucatu. 27.
Zornia sp.	10	Corumbataí. 41.
Zornia sp.	10	Corumbataí. 38.

Table 1 (*continued*)

MIMOSOIDEAE		
Mimoseae		
Mimosa batucatuana Hoehne	ca. 13	Pardinho. 26.
Mimosa capillipes Benth.	13	Botucatu. 24.
Mimosa daleoides Benth.	ca. 52	Botucatu. 19.
Mimosa lasiocarp Benth.	13	São José do Rio Preto. 63.
Mimosa macrostachya (Benth.) Macbr.	13	São Pedro. 44.
Mimosa rixosa Mart.	13	Mirassol. 16.
	13	Botucatu. 31.

DISCUSSION

CAESALPINIOIDEAE

Cassieae—The count of $n = 14$ for *Cassia rugosa* is evidently the first report for this species. The following species of *Cassia* are apparently invariable as to chromosome number and the numbers reported here confirm previous reports: *C. bicapsularis* ($n = 14$), *C. flexuosa* ($n = 8$), *C. javanica* ($n = 14$), *C. langsdorffii* ($n = 7$), *C. latistipula* ($n = 7$), *C. multijuga* ($n = 12$), *C. pilifera* ($n = 11$), *C. siamea* ($n = 14$), and *C. tetraphylla* ($n = 7$). *Cassia occidentalis* has been reported several times each as $n = 13$, or $2n = 26$, and $n = 14$, or $2n = 28$. Our material showed $n = 13$. Counts of $n = 16$ and $2n = 32$ and 64 have been reported for *C. patellaria*. We report $n = 16$. *Cassia rotundifolia* has been reported as $n = 8$ and $2n = 14$, 16, and 32. Our report is $n = 8$. *Cassia speciosa* has been reported as $n = 12$ and 13, and $2n = 24$. The present report is $n = 13$. *Cassia splendida*, which we determined as having $n = 13$, has also been reported as having $2n = 26$ and 52. A discussion of basic numbers in the genus *Cassia* is presented by Irwin and Turner (1960).

PAPILIONOIDEAE

Aeschynomeneae—The counts of $n = 10$ for *Aeschynomene falcata* and *A. racemosa* are initial reports for these species. The genus has $x = 10$ with a low incidence of tetraploidy.

Crotalarieae—The counts for *Crotalaria depauperata* ($n = 8$), *C. foliosa* ($n = 16$), *C. laeta* ($n = 8$) and *C. velutina* ($n = 16$) constitute initial reports for these species. The counts presented for *C. anagyroides* ($n = 8$), *C. incana* ($n = 7$), *C. maypurensis* ($n = 8$), *C. specta-*

bilis ($n = 8$), and *C. stipularia* ($n = 16$) confirm previous reports. The great majority of the species of *Crotalaria* are based on $x = 8$ with tetraploidy being frequent in the genus.

Desmodieae—The count of $n = 11$ for *Desmodium platycarpum* is the first report for this species and agrees with the vast majority of previous reports in the genus.

Diocleae—The count of $n = 11$ for *Canavalia brasiliensis* is the first report for this species and is consistent with previous reports in the genus, all being based on $x = 11$.

Galactieae—The counts of $n = 10$ for *Galactia decumbens* and *G. eriosematoides* constitute the initial reports for these species. The genus has $x = 10$.

Geoffroeeae—The count of $n = 8$ for *Pterodon pubescens* is the second report for the species and confirms the first report (Bandel, 1974).

Glycineae—The count of $n = 10$ for *Centrosema brasilianum* is the first report for this species. The count for *C. bracteosum* ($n = 10$) confirms the initial report for that species (Bandel, 1974). Reports of $n = 9$, 10, and 11 have been made in the genus.

Indigofereae—The count of $n = 8$ for *Indigofera suffruticosa* concurs with several previous reports; however, Shibata (1962) has reported $2n = 32$ from Columbia.

Phaseoleae—The counts of $n = 11$ for *Phaseolus bracteatus* and *P. lathyroides* confirm previous reports for these species.

Pterocarpeae—A count of $n = 10$ is presented for *Machaerium aculeatum*. A previous count of $n = 8$ is available for this species (Bandel *in* Gurgel and Gurgel, 1969). The only other species reported in the genus, *M. acutifolium* Vog., also has $n = 10$ (Bandel, 1974). The count of $n = 10$ for *Tipuana tipu* confirms a previous report (Atchison, 1951) for this monotypic genus.

Robinieae—Previous reports of $2n = 20$ (Atchison, 1951) and $2n = 22$ (Simmonds, 1954; Tixier, 1965) have been published for *Gliricidia sepium* (= *G. maculatum* Benth.). Our count is $n = 11$.

Stylosantheae—The count of $n = 20$ for *Arachis prostrata* agrees with a previous report by Husted (1933). Mendes (1947), in report-

ing $n = 10$ for this species, left some question as to the exact identification of his material. The count of $n = 10$ for *Stylosanthes guianensis* confirms an earlier report for this species cited in Darlington & Wylie (1955) and is consistent with reports for other species of the genus. The count for *Zornia pardina* ($n = 10$) is the first report for this species. The genus has $n = 10$ with polyploidy apparently unreported.

MIMOSOIDEAE

Mimoseae—First reports are made for six species of *Mimosa: M. batucatuana* ($n = c.$ 13), *M. capillipes* (n = 13), *M. daleoides* (n = ca. 52), *M. lasiocarpa* ($n = 13$), *M. macrostachya* ($n = 13$) and *M. rixosa* ($n = 13$). Meiotic chromosomes in *Mimosa* are difficult to study because of the small size of the microsporocytes and the tendency of members of bivalents to separate. The probable count of $n = 52$ for *M. daleoides* is the highest number yet reported in the genus. *Mimosa* has $x = 13$ as its most frequent basic number, and therefore *M. daleoides* is a probable octoploid.

LITERATURE CITED

ATCHISON, E. 1951. Studies in the Leguminosae. VI. Chromosome numbers among the tropical woody species. Amer. J. Bot. **38:** 538–546.

BANDEL, G. 1974. Chromosome numbers and evolution in the Leguminosae. Caryologia **27:** 17–32.

DARLINGTON, C. D. & A. P. WYLIE. 1955. Chromosome atlas of flowering plants. George Allen and Unwin, London. 519 pp.

GURGEL, J. T. A. & O. A. GURGEL FILHO. 1969. Genética e melhoramento de essências florestais Brasileiras. *In:* Melhoramento e genética. Editora da Universidade de Sâo Paulo, Sâo Paulo. 301 pp.

HUSTED, L. 1933. Cytological studies on the peanut, *Arachis*. I. Chromosome number and morphology. Cytologia **5:** 109–117.

IRWIN, H. S. & B. L. TURNER. 1960. Chromosomal relationships and taxonomic considerations on the genus *Cassia*. Amer. J. Bot. **47:** 309–318.

MENDES, A. J. T. 1947. Estudos citológicos no gênero *Arachis*. Bragantia **7:** 257–267.

MOORE, R. J. (editor). 1974. Index to plant chromosome numbers, 1972. Regnum Veg. **91:** 1–108.

SHIBATA, K. 1962. Estudos citológicos de plantas columbianas silvestres y cultivadas. Jour. Agr. Sci. (Tokyo) **8:** 139–146.

SIMMONDS, N. W. 1954. Chromosome behavior in some tropical plants. Heredity **8:** 139–146.

TIXIER, P. 1965. Données cytologiques sur quelques Legumineuses cultivées ou spontanées du Vietnam et du Laos. Rev. Cytol. Biol. Veg. **28:** 135–155.

TURNER, B. L. & H. S. IRWIN. 1961. Chromosome numbers in some Brazilian Leguminosae. Rhodora **63:** 16–19.

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